

SOME NEPOMORPHA (CORIXIDAE, NOTONECTIDAE AND NEPIDAE) (HEMIPTERA-HETEROPTERA) OF NORTH-WEST AUSTRALIA

by I. LANSBURY*

Summary

LANSBURY, I. (1984) Nepomorpha (Corixidae, Notonectidae and Nepidae) (Hemiptera-Heteroptera) of North-West Australia. *Trans. R. Soc. S. Aust.* **108**(1), 35-49, 12 June, 1984.

New taxa of Notonectidae, viz. *Walambianisops wandjina* n.gen. and sp., *Enithares gwini* n.sp., *Anisops douglasi* n.sp., and Corixidae, viz. *Agraptocorixa gambrei* n.sp. are described from the coastal region of the Kimberley, north-west Australia. Brief notes are given on the water-bugs of the Kimberley vis-a-vis those of the coastal zone, the Arnhemland Escarpment, and northern Queensland. A key to the Australian genera of Notonectidae, including new genera, is given, as well as a supplementary key to the Anisopinae using a combination of secondary sexual characters.

KEY WORDS: Corixidae, *Agraptocorixa*, Notonectidae, *Anisops*, *Enithares*, *Paranisops*, *Walambianisops*, zoogeography.

Introduction

Williams (1979) gives a concise description of north-western Australian freshwater fauna and a list of the water bugs recorded. Most of the species he listed are characteristically Australian, although some, according to the data given, were collected from habitats east of the Kimberley in the Northern Territory. The Kimberley data available to Williams supported his view that north-western Australia including the Kimberley is not a distinct fluvio-faunal province, but some more recent data derived from collections in the coastal region shed additional light on the biogeographical relationships of water-bugs in this area. They show that the water-bug fauna of the coastal region is unusual in having at least one link with Timor and Lombok, and is clearly not allied to the characteristic Australian fauna which extends eastwards to New Caledonia and the New Hebrides—as typified by the *Enithares woodwardi* Lansbury complex of sibling species (*bergrothi* Kirkaldy and *hebridensis* Lansbury). The new data suggest that species groups common to north-western Australia and Timor-Lombok have not in general become widespread over Australia.

There is some evidence that a few species of water-bugs are distributed along the tropical fringe from north-west Australia, through the Northern Territory to north Queensland. The lack of data precludes a realistic discussion of the zoogeography of the north-west coastal region compared with areas of the Northern

Territory and Queensland; so many groups of water-bugs, i.e. Veliidae, Gerridae, Notonectidae (*Anisops*), Corixidae (*Microneecta*) and Hydrometridae, are insufficiently known from the north west coastal region. A few general comments are given on the relationships of the taxa of the north-west with other areas of "northern" Australia and elsewhere under species descriptions.

Family: CORIXIDAE

Agraptocorixa gambrei sp. nov.

FIGS. 1-12

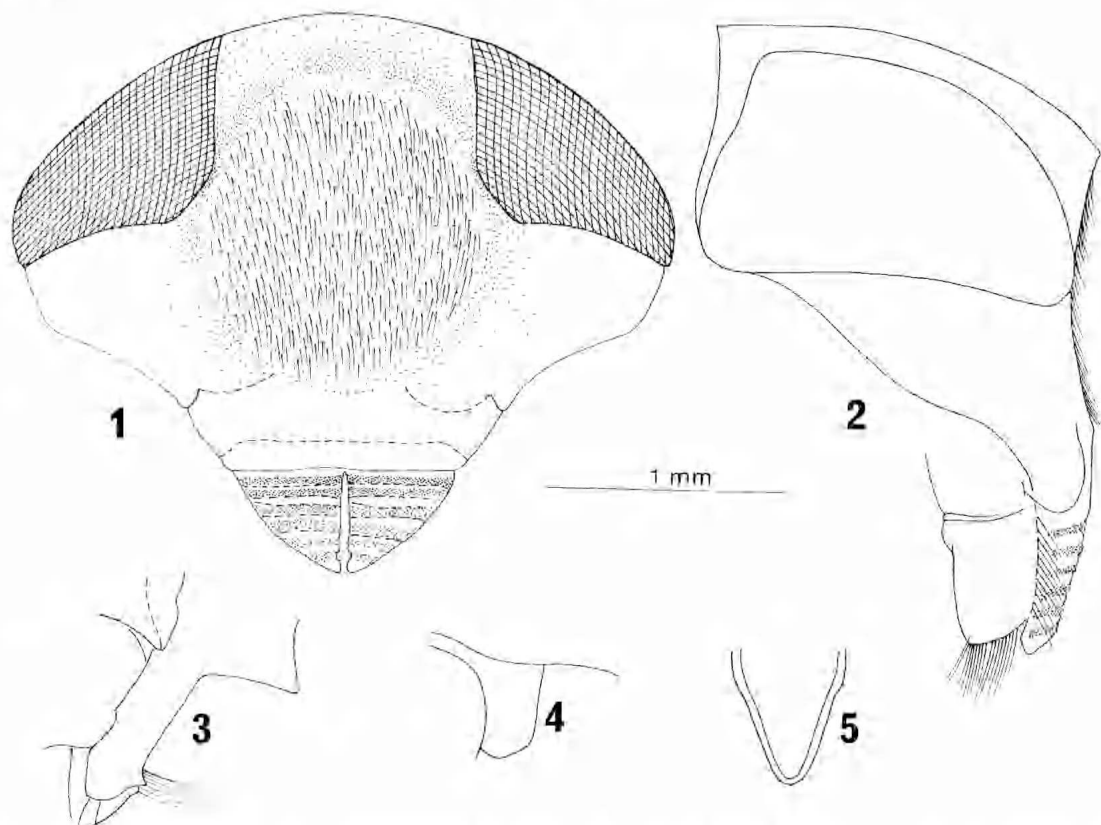
Holotype: Male, WAM 79-294-317. W.A., Port Warrender. ix.1976, A. M. Douglas in the Western Australian Museum, Perth.

Dimension of holotype: Length, 7.75 mm, width across the eyes, 2.8 mm.

Colour: Vertex pale yellow, posterior margin dark brown. Pronotum dark brown. Clavus yellowish brown with inner lateral anterior and posterior angles dark brown. Corium yellowish brown with a large dark brown area along posterior half of the claval suture, the infuscated area almost reaching the embolium. Membrane heavily infuscated. Embolium dark reddish brown becoming paler distally. Thorax ventrally pale yellow, abdomen slightly darker. Front legs yellow, area of pala claws dark brown. Middle femur pale yellow, distal third and remainder of leg dark brown. Hind femur pale yellow, tibia and tarsi rather darker.

Structure: Vertex rounded and slightly produced between the eyes. Interocular space (synthlipsis or narrowest part between the eyes) less than an eye's width 1.3:1.4. Head length to pronotal length 75:100. Facial im-

* Hope Entomological Collections, University Museum, Oxford, U.K.



Figs 1-5: *Agraptocorixa gambrei* sp. nov. holotype male. (1) head from the front; (2) *ibid.*, side view; (3) osteole of scent gland; (4) lateral lobe of prothorax; (5) metaxyphus.

pression conspicuous (Figs 1, 2), clothed with fine silvery hairs, impression extending from lower margin of eyes almost to transverse sulcations. Pronotal width twice median length, covered with fine dark brown adpressed spines arising from black bases. Clavus with similar spines about twice as long as those on the pronotum. Corium and right membrane clothed in longer dark brown hairs. Left membrane with sparse scattered short hairs. Pruinoso area of the claval suture one third length of corial pruinose area 34:100. Post-nodal pruinose area length about half width 4:10. Lateral lobe of the prothorax as in Fig. 4. Metaxyphus as in Fig. 5. Sixth-eighth tergites as in Figs 6-8. Sixth tergite with an extension, no "strigil" visible. Front leg (Fig. 9) femur with several stout spines, pala with fifteen pegs, claws conspicuous. Middle femur curved, almost quadrate in section, inner margin densely clothed with fine silvery hairs. Hind femur (Fig. 10) anteriorly pubescent. The relative lengths of legs are shown in

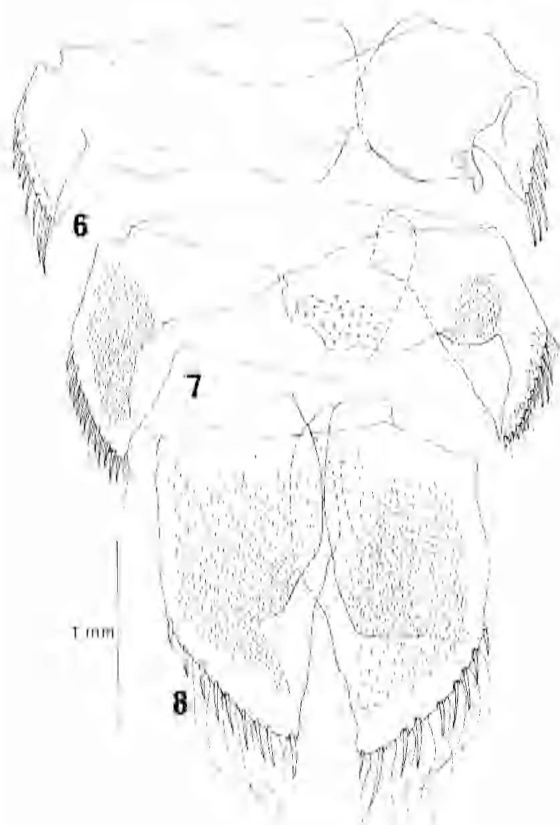
Table 1. *Male* genitalia (Figs 11, 12): right clasper elongate wedge-shaped, left clasper long and thin.

Comparative Notes

It is not possible to key out *A. gambrei* in Knowles (1974) as the species does not have a strigil. The sixth tergite has a projection rather like that of *A. parvipunctata* (Hale), *A. halei* Hungerford, and *A. hyalinipennis* (Fabricius), the latter does not occur in Australia, but there is no comb-like structure present. The number of pala pegs eliminates *A. parvipunctata* and *A. halei*, as both have at most twelve pala pegs, the right claspers of both are quite distinctive, and the *hyalinipennis* males have

TABLE 1. *Relative lengths of legs for Agraptocorixa gambrei* sp. nov.

	Femur	Tibia	Pala	Claw
Front leg	100	44	80	25
Middle leg	100	46	29	29
Hind leg	100	103	113	40



Figs 6-8: *Agraptochorixa gambreii* sp. nov. holotype male. (6-8) tergites 6-8.

the face flattened but not depressed and the peg row is much longer (22+), extending two thirds the length of the pala palm. The facial depression of *A. gambreii* is clearly concave and well-defined, the peg row short not reaching half way across the palm.

There are now six species of *Agraptochorixa* known from Australia. Of these, *A. halei*, *A. parvipunctata*, *A. hirtifrons* (Hale) and *A. gambreii* sp. n. appear to be endemic, while *A. eurynome* Kirkaldy and *A. macrops* Hungerford are also known from New Guinea (Jansson 1982). *A. parvipunctata* and *A. eurynome* are both widespread species occurring over most of Australia and Tasmania; *A. hirtifrons* occurs sporadically, and *A. halei* seems to be a rather more tropical element, occurring in north-west Australia, the N.T. and northern Qld. Knowles (1974) provides records for N.S.W. and Alice Springs. *A. macrops* is known from New Guinea and Bunbury, W.A. *A. gambreii* is known only from the coastal region of the Kimberley district.

Agraptochorixa halei Hungerford

FIGS 13-19

Agraptochorixa halei Hungerford, 1953, pp. 42-44.

Agraptochorixa halei: Knowles, 1974, pp. 181-183, figs 25-32.

Hungerford (1935) and Knowles (1974) have described and figured *A. halei* extensively. However, the form from Mt Trafalgar differs in some minor details from the typical form. The claw of the front leg is large but almost transparent in the "prepared" state (Fig. 13). The strigil is rather larger, almost horseshoe-shaped with five combs (Figs 15, 16) rather than three as described previously. Earlier figures of the 7th tergite show what appears to be a "free" triangular lobe dextrally; however, the posterior margin of the 7th tergite is continuous, and there is a narrow, lightly sclerotised strip which superficially resembles a complete break in the tergite (shown as a pair of dotted lines on Fig. 14). Knowles' figure of the left clasper is drawn from an unusual angle; the clasper is broad with a prominent finger-like projection at its base (Fig. 17). The right clasper is much like previous illustrations (Fig. 18). The tip of the aedeagus is as shown (Fig. 19).

Material examined: W.A. Prince Regent River Reserve, Mt. Trafalgar, 15°75'S, 125°04'E, 26.viii.1974, W. J. Bailey & K. T. Richards, one male and one female (Department of Agriculture, Perth, W.A.).

Family: NOTONECTIDAE

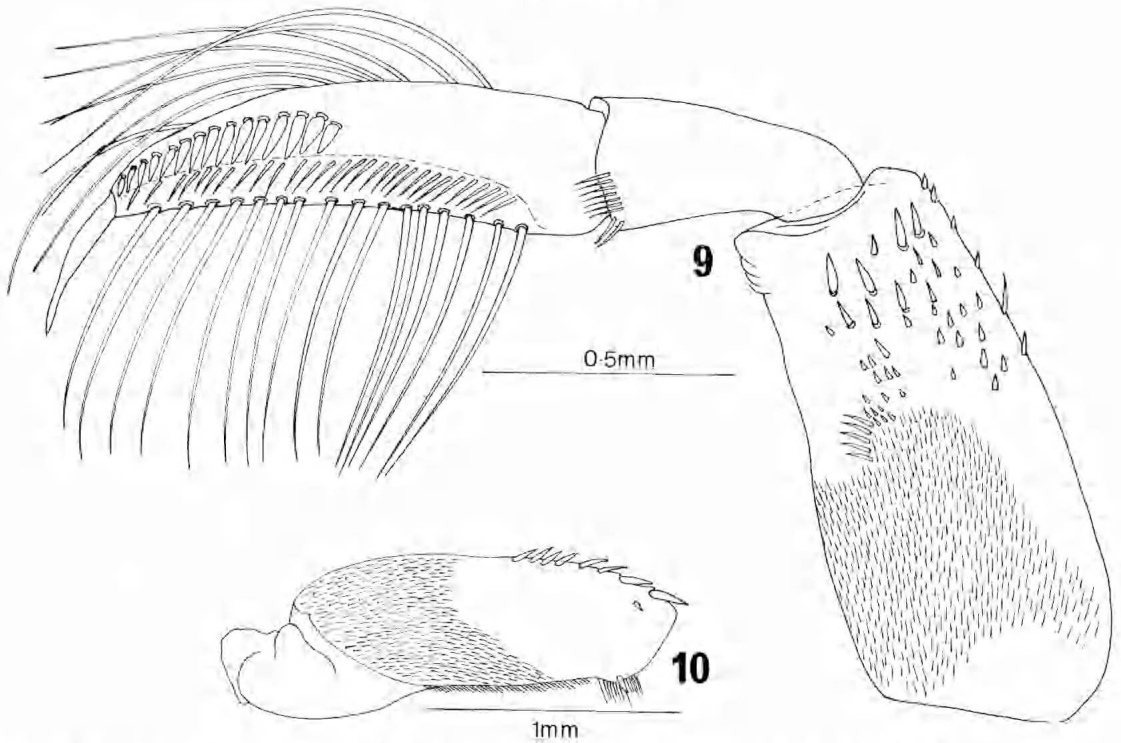
Anisops douglasi sp. nov.

FIGS 20-22

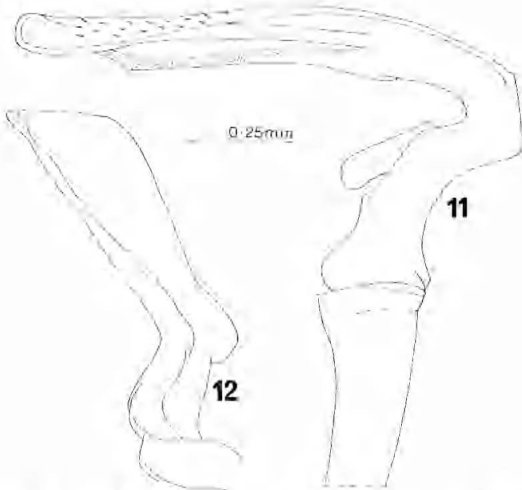
Holotype male: WAM 79-294-317, W.A., Kimberley region, Port Warrender, ix.1976, A. M. Douglas; in the Western Australian Museum, Perth. Dimensions of holotype: Length 6.9 mm.

Colour, ethanol specimen: Eyes grey with facets black. Pronotum anteriorly hyaline grey, posteriorly faintly tinged with orange. Scutellum creamy yellow. Elytra hyaline, appearing grey with dorsal coloration showing through. Abdomen brown, ventrally rather darker with intersegmental membranes pale yellow. Connexivum pale yellow tinged with orange.

Structure: Viewed dorsally the head is broadly rounded with the anterior inner lateral margins of the eyes convergent. Greatest width of head fractionally less than pronotal humeral width, about ten times anterior width of the vertex, and almost three times the median head length. Synthlipsis wide, over half but



Figs 9-10: *Agraptocorixa gambrei* sp. nov. holotype male. (9) front leg; (10) hind femur.



Figs 11-12: *Agraptocorixa gambrei* sp. nov. holotype male. (11) left clasper; (12) right clasper.

less than two-thirds the anterior width of the vertex. Median pronotal length about one third longer than the head. Pronotal humeral width just over twice median length, lateral margins straight, slightly divergent over half median length. Facial tubercle enlarged with small stiff hairs (Fig. 21). Rostral prong large,

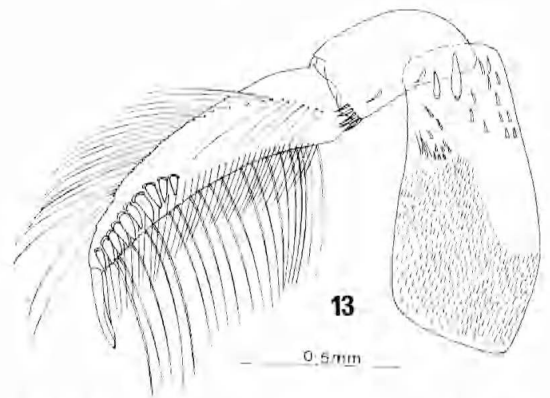
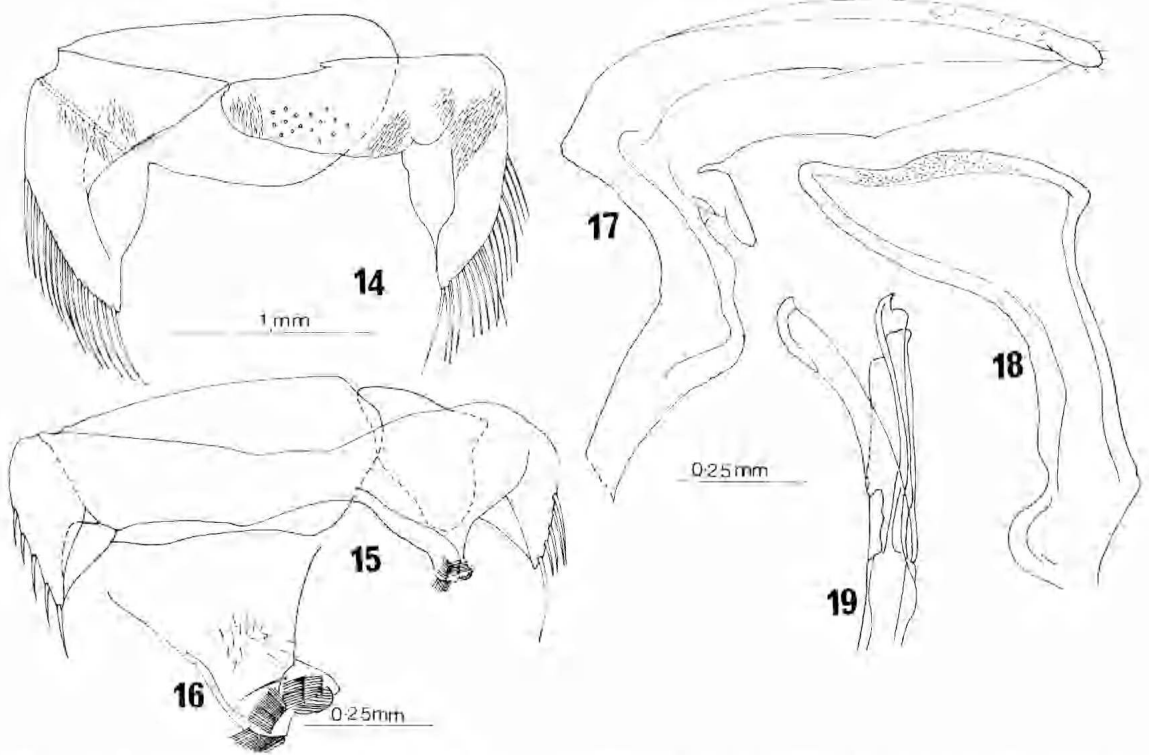


Fig. 13: *Agraptocorixa halei* Hungerford male. (13) front leg.

the tip almost reaching the anniferous tubercle. Labrum slightly broader than long, apex acuminate. Stridulatory comb with twelve pegs, outer seven rather longer (Fig. 22). Chaetotaxy of the front leg as shown (Fig. 20).

Comparative notes

This species keys out to *A. doris* Kirkaldy in Lansbury (1969). However, the large rostral prong, enlarged facial tubercle, and small



Figs 14–19: *Agraptocorixa halei* Hungerford male. (14) 6th tergite; (15) 7th tergite; (16) strigil; (17) left clasper; (18) right clasper; (19) tip of aedeagus.

stridulatory comb distinguishes *A. douglasi* from *A. doris*. In Brooks' (1951) key, *A. douglasi* appears to be closely allied to *A. assimilis* White, a New Zealand species, but the latter does not have an enlarged facial tubercle, and the stridulatory comb has about 25–28 pegs (*A. douglasi* has rather fewer). Young (1962) redescribed *A. assimilis* and showed that Brooks' description of the stridulatory comb was misleading, for the pegs decrease in size gradually towards the inner margin of the front tibia; the "steps" figured by Brooks is due to some of the pegs having been broken.

Anisops occipitalis Breddin
FIGS 23–25

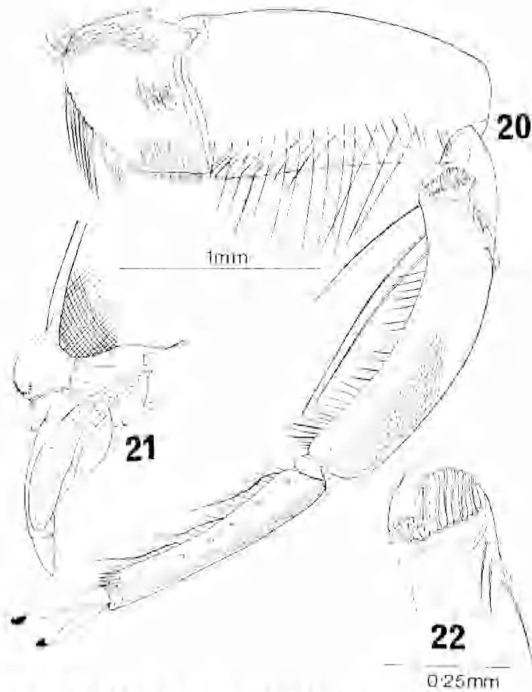
Anisops occipitalis Breddin, 1905, p. 152.

Anisops occipitalis: Brooks, 1951, pp. 344–5, Pl. 39, fig. 22.

Anisops occipitalis: Lansbury, 1969, pp. 438–440, figs. 18–22. (*Anisops ocellaris* Hale, 1923 synonymised with *occipitalis*).

The occurrence of *A. occipitalis* in mainland Australia is rather patchy. Under the

name "*ocularis*", Hale (1923) first described and recorded the species from Australia (Darwin). Brooks (1951) gives data for Sir Graham Moore Island, and the Barron River, Qld. I have collected material from Petersen Creek, Yungaburra near Atherton, Qld, which has been provisionally assigned to *A. occipitalis*. This species bears some resemblance to *A. deanei* Brooks. Both have prominent rostral prongs, and the apex of the third rostral segment is clearly wider than the base of the fourth (Fig. 23); both species have five spines on the inner surface of male front tibia (Fig. 24), and the number of stridulatory pegs is roughly the same (20–24). The front femur of *A. occipitalis* is most distinctive, being broad proximally with "steps" distally; *A. deanei* has the upper and lower margins of the femur more or less evenly curved. According to Brooks (1951) *A. deanei* males are at most 6 mm long, but I have found that this species is usually more than 6 mm long, with a maximum length of 6.75 mm (Lansbury 1969). Large collections of *A. deanei* from "southern" Australia made in 1979 show that *A. deanei*



Figs 20-22: *Anisops douglasi* sp. nov. holotype male. (20) front leg; (21) side view of rostrum; (22) stridulatory comb.

varies rather more in size than originally thought (Lansbury 1969). Extensive series from habitats around Alice Springs vary from 6.5-7.5 mm long. *A. occipitalis* varies sufficiently for smaller males of *A. occipitalis* to overlap with the *A. deanei* males. However, the little data there suggests that *A. occipitalis* is a "coastal" species in Australia.

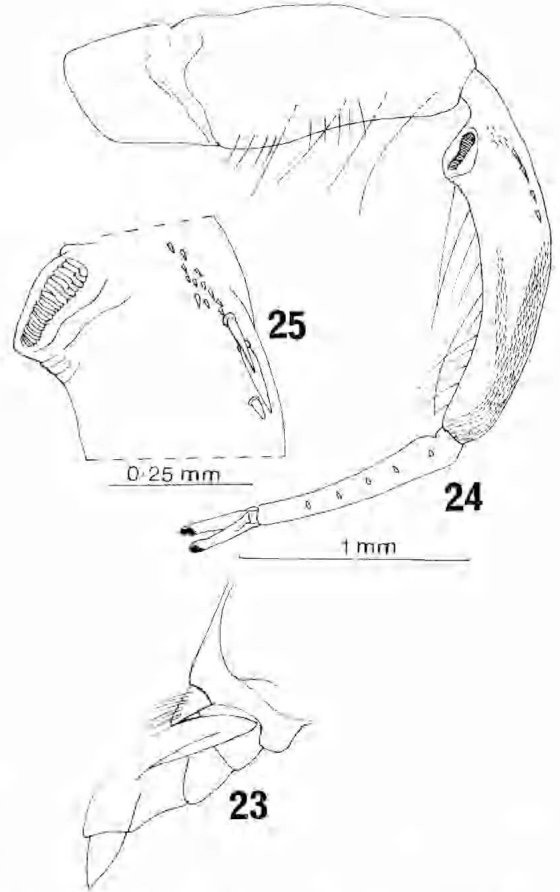
Material examined: Western Australia: WAM 75-163-9, Wotjulum Mission via Derby, October 1955, A. M. Douglas, two males and two females in the Western Australian Museum, Perth. N.W. Australia, Prince Regent River Reserve, Charney River, 14.viii.1974, W. J. Bailey & K. Richards, one male in Department of Agriculture, Perth, W.A.

***Enithares gwini* sp. nov.**

FIGS 26-30, 33-36

Holotype male: WAM 79-294-317, two male and seven female paratypes, Western Australia, Port Warrender, Kimberley, October, 1976, A. M. Douglas. One male and female paratypes, WAM 79-218-27, Kalumburu Mission, Kimberley, Western Australia, June, 1960, A. M. Douglas & G. Mees in Western Australian Museum, Perth.

Shape: Broad robust species, lateral margins of the body converging slightly about midway

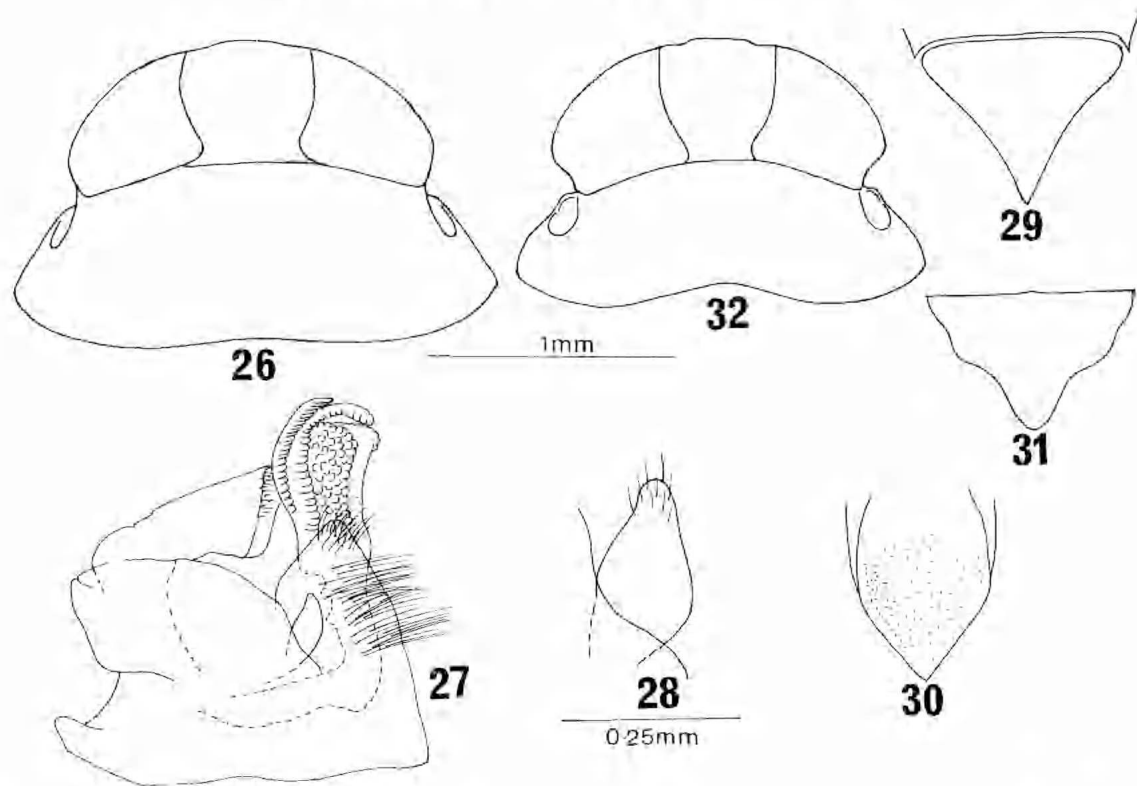


Figs 23-25: *Anisops occipitalis* Breddin male. (23) side view of rostrum; (24) front leg; (25) stridulatory comb.

body length, Median head length appearing to be rather short compared with body length (1:10).

Colour: Eyes brown. Vertex and anterior half of the pronotum straw yellow, viewed from the front, vertex with a brown bar between the eyes (not visible from above). Posterior half of the pronotum hyaline. Scutellum bluish-black, lateral margins yellow. Anterior angles of the clavus and corium yellow, pale coloration reaching the nodal furrow, remainder of clavus and corium rich brown to black in dry mounted specimens, colour in ethanol appearing rather darker with yellow areas rather more red than yellow. Membrane bluish-black. Embolium greyish yellow. Sternites black with central keel greyish yellow.

Structure: Head rounded, anterior width of the vertex more or less continuous with the



Figs 26–32: *Enithares* sp. males. *E. gwini* sp. nov. Figs 26–30; (26) head and pronotum dorsum; (27) genital capsule; (28) paramere enlarged; (29) labrum; (30) metaxyphus; *E. lambokensis* Lansbury. Figs 31–32: (31) labrum; (32) head and pronotum dorsum.

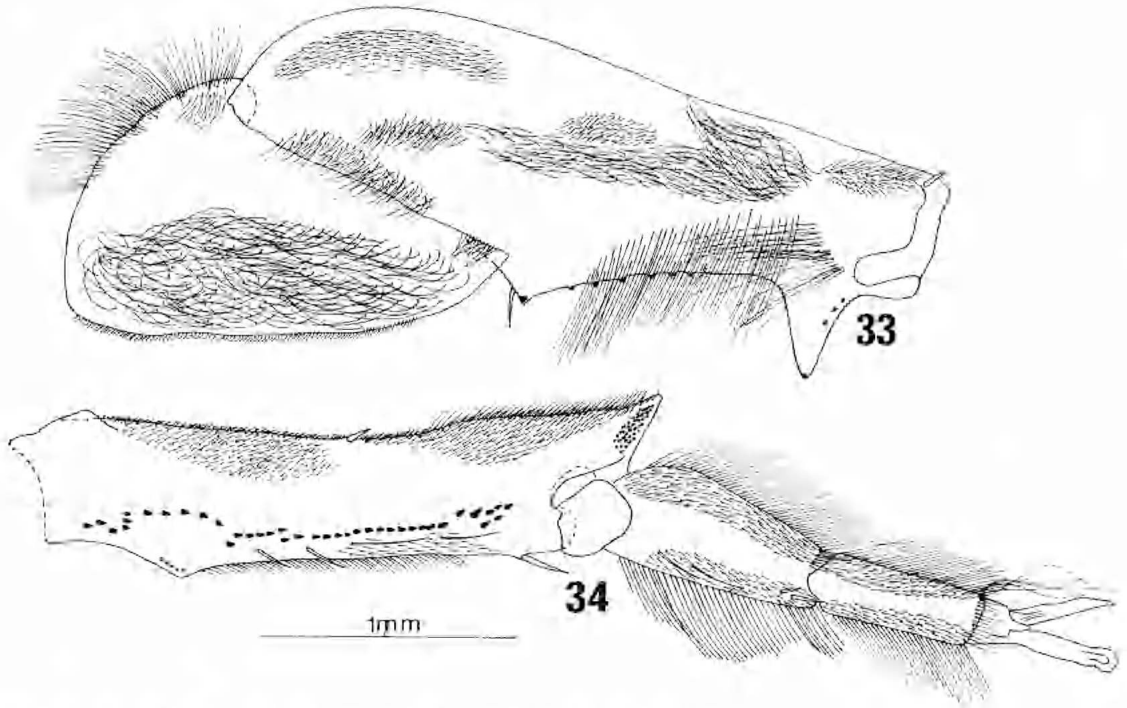
eyes. Greatest width of head about two thirds pronotal humeral width, just over two and a half times the anterior width of the vertex, and three times median head length. Synthipsis wide, just over half the anterior width of the vertex. Head length slightly less than the anterior width of vertex. Pronotal humeral width almost three times median length, lateral margins strongly divergent, appearing straight although they are slightly convex. Dorsal margin of pronotal fovea directed obliquely laterad behind the eyes (Fig. 16). Nodal furrow obliquely turned towards the head and less than its own length removed from the membranous suture. Labrum acutely triangular (Fig. 29). Mesotrochanter rounded densely clothed in long curly hairs, inner lower margin of middle femora densely hairy (Fig. 33). Of the middle tibia and tarsi (Fig. 34), the tibia is prolonged at outer distal margin, and the inner proximal margin has a less prominent projection. Hind femur of male produced distad-ventrally (Fig. 36). First tarsal segment of the hind leg with a ridge along the inner

margin fringed with long hairs along both margins (Fig. 35). Metaxyphus triangular (Fig. 30). Male genital capsule as illustrated (Fig. 27); parameres (claspers) symmetrical (Fig. 28).

Comparative notes

Similar to *Enithares lombokensis* Lansbury (Fig. 32) and *E. buhleri* Brooks, *E. gwini* is a more robust species. The front tibia of *E. gwini* is parallel sided, that of *E. buhleri* (Fig. 37) is distally conate, the front tibia of *E. lombokensis* (Fig. 39) deeply concave with a blunt projection distally. The middle tibia of *E. gwini* has a blunt projection apically, and is sharply produced distally whereas *E. buhleri* (Fig. 38) and *E. lombokensis* (Fig. 40) both have more or less parallel-sided mid-tibiae which are sharply produced distally.

Three other species of *Enithares* are known from Australia. *E. woodwardi* is widespread over much of "southern" Australia. *E. huckeri* Hungerford occurs sporadically in northern N.S.W. and Qld. The third species *E. loria*



Figs 33-34: *Enithares gwini* sp. nov. holotype male. Middle leg.

Brooks, originally described from New Guinea, is found fairly frequently along the tropical fringe of the N.T., Qld, and in the Solomon Islands (Lansbury 1968).

***Walambianisops wandjina* gen. and sp. nov.**
FIGS 41-57

Generic diagnosis: Vertex extending beyond the eyes. Antennae two-segmented. Labrum and rostrum conspicuously hairy. All legs of both sexes with two-segmented tarsi. Front coxa and femur long. Coxal plates (third episternum and infracoxal plates of Aucts.) bare, distally fringed with short black hairs. Fifth and sixth sternites carinate, narrowly bare, fringed with short black hairs.

Type species: *Walambianisops wandjina* sp. n.

In the discussion following the description of this new genus and species, a section is included on *Paranisops* which is a superficially similar genus. The merits of the latter as a generic entity are commented upon.

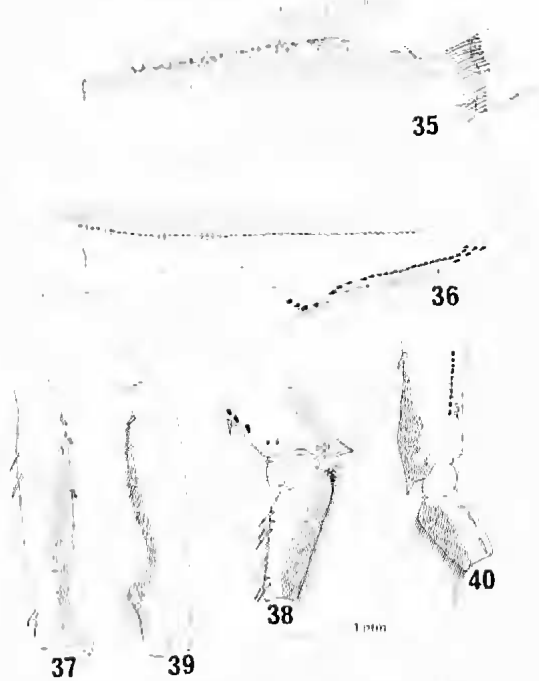
***Walambianisops wandjina* sp. nov.**
FIGS 41-57

Type series: Holotype male, seven male and six female paratypes WAM 79-287-93 and WAM 79-294-317 W.A., Port Warrender, Kimberley,

ix.1976, A. M. Douglas: two male and three female paratypes WAM 79-218-27 W.A., Kalumburn Mission, Kimberley, vi.1960, A. M. Douglas & G. Mees: one female paratype WAM 79-165-9 W.A., Wotjulum Mission via Derby, Kimberley, ix.1955, A. M. Douglas in the Western Australian Museum, Perth. One male and one female paratypes, N.W. Australia, Prince Regent River Reserve, 17°07'S, 125°33'E ex ravine pond, 17.viii.1974, W. J. Bailey & K. T. Richards, in the Department of Agriculture, Perth, W.A. One female paratype, W.A., Koolan Island, permanent pool in dry creek bed, 13.ii.1978, W. D. Williams in the collections of Adelaide University.

Length: males 9-9.6 mm, females 9-9.9 mm.

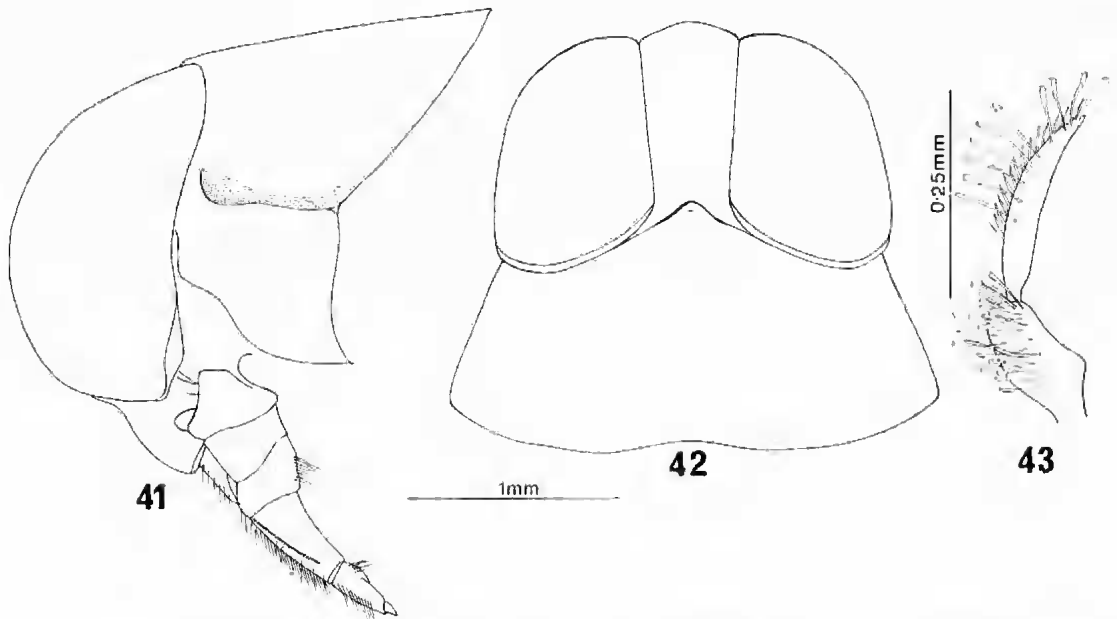
Colour: Eyes either greyish with pale horizontal bands or dark reddish brown. Head yellow with a small brown spot between the eyes on the frons. Pronotum anteriorly greyish brown, posteriorly more hyaline, appearing darker due to dorsal coloration showing through. Scutellum dark brown to black, shining, apex and part of the lateral margins orange yellow. Clavus and corium apically suffused dark brown to black, occasionally the dark suffusion extending over most of the clavus and along the outer lateral margin of the corium, both the clavus and



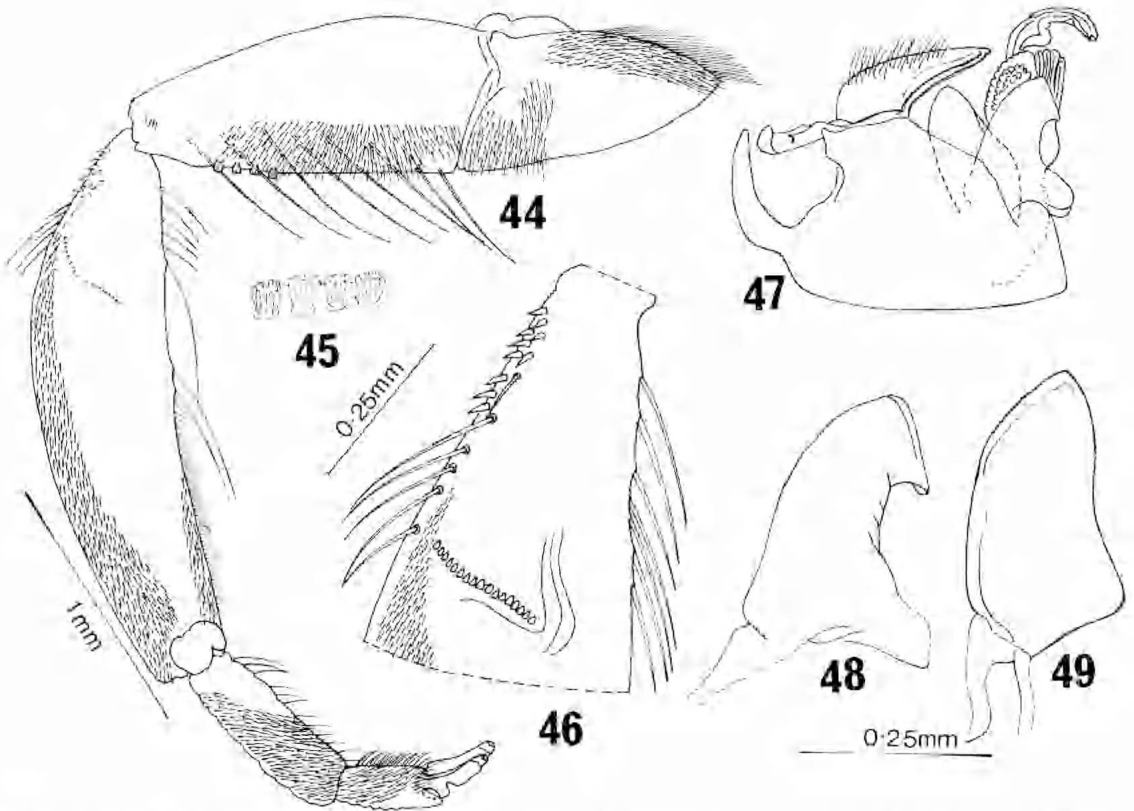
Figs 35-40: *Enithares* sp. males, *E. gwini* sp. nov. Figs 35-36: (35) first tarsus of hind leg; (36) hind femur distally; *E. buhleri* Brooks. Figs 37-38, *E. lombokensis*. Figs 39-40: (37 & 39) front tibia; (38, 40) distal end of middle tibia and 1st tarsal segment.

corium faintly iridescent green. Remainder of the clytra and membrane hyaline, the reddish brown tergites showing through. Legs dark-reddish brown with margins narrowly yellow, particularly conspicuous on the front and middle legs. Thorax reddish-brown with yellow patches. Sternites dark brown to bluish black. Lateral margins of the connexivum narrowly pale yellow.

Structure: Eyes large and protuberant, vertex extending beyond the eyes (Fig. 42), dorsally between the eyes shallowly depressed. Facial tubercle enlarged and rounded, frons above facial tubercle deeply concave. Labrum and rostrum hairy, labrum slightly broader than long. Anterior lateral margin of the third rostral segment finely serrate (Fig. 41). Greatest width of head five times anterior width of vertex, and about six times width of the synthlipsis which is almost as wide as the anterior width of the vertex. Head width more than twice median head length. Anterior margin of pronotum raised and produced between the eyes. Pronotum almost one and a half times longer than the head, humeral width greater than head width and almost twice the median pronotal length, lateral margins strongly divergent. The female is much like the male, head width three times head length,



Figs 41-43: *Walambianisops wandjina* gen. and sp. nov. male. (41) head and pronotum from the side; (42) *ibid.*, dorsum; (43) antennae.



Figs 44-49: *Wulambianisops wandjina* gen. and sp. nov. male. (44) front leg; (45) enlarged detail of front leg; (46) enlarged detail of front tibia; (47) genital capsule; (48, 49) right and left parameres.

pronotum almost twice as long as the head. Scutellum large, strongly convex, about as broad as long.

Front coxa and femur longer than tibia, front tarsi two segmented, claws short and blunt apically, those of the female spinose. Femur with four groups of elongate setae arranged like inverted cones (Figs 44, 45). Front tibia moderately spinose with a row of "pegs" separate from each other forming a "stridulatory-comb" (Fig. 46). Middle femur elongate and spinose, chaetotaxy not differing greatly from that of front leg, but without the peg-row. Very little difference between chaetotaxy of males and females. Hind leg elongate, fringed with moderately long swimming hairs, tarsi of middle and hind legs two-segmented.

Coxal plates bare and shining with coarse irregular oblique striations, distally fringed with black hairs (Fig. 51). Third sternite just visible latero-distad of coxal plate. Fourth sternite with a trichome, fifth-seventh sternites variably carinate, apically narrowly bare, fringed with

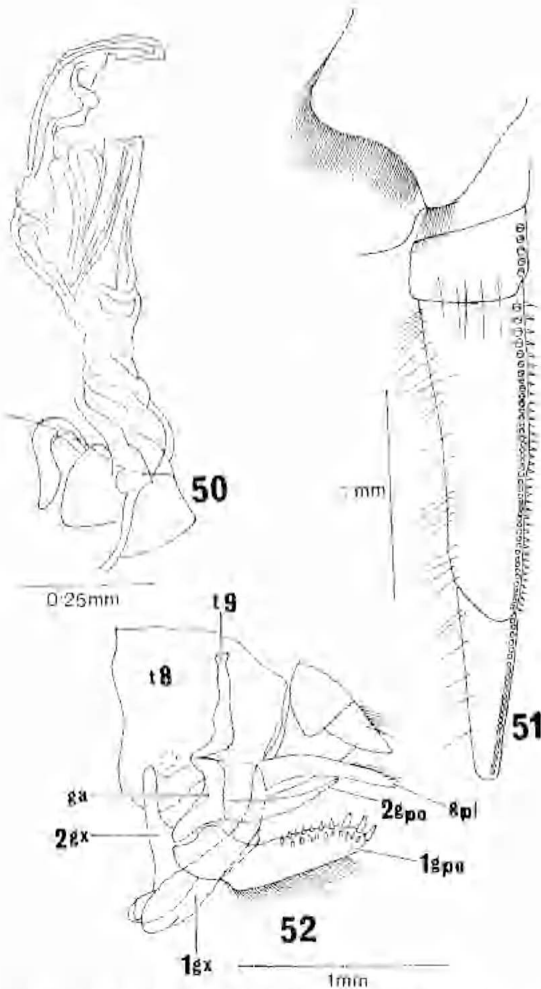
short black hairs. Female seventh sternite not as acutely carinate as preceding sternites, males rather more sharply convex than carinate. Outer lateral margins of connexival segments two-four with small half-moon shaped projections arising from depressions in the integument (Fig. 51). Arising from the lateral margins of the seventh and eighth tergites pale yellowish hairs which are much longer than those along the inner margins of the connexivum. Male seventh abdominal tergite with a prominent sclerotised spine on the caudo-sinistral margin (Figs. 53, 54). Male operculum (subgenital plate) with fringes of hairs distally (Fig. 57). Female operculum much larger, deeply convex and fringed with several rows of hairs and spines (Figs 55, 56).

Antennae two-segmented, both segments with modified spatulate hairs (Fig. 43).

Male genitalia (Fig. 47): capsule partially cleft posteriorly and heavily sclerotised, para-

Discussion

Superficially, *Walambianisops* resembles *Paranisops endymion* (Kirkaldy). However, despite resemblance in size and coloration, only one primary character is common to both genera: all legs of both sexes have two-segmented tarsi. *Walambianisops* has many features in common with *Anisops*, but the operculum is not sharply carinate as it is in *Anisops*; it is variably convex, i.e. it is structurally midway between *Anisops* and *Paranisops*. The males of *Walambianisops* have a large sclerotised spine on the seventh tergite (Figs 53, 54); *Anisops* and *Buenoa* Kirkaldy (New World counterpart of *Anisops*) have a variously shaped projection on the same tergite. This projection is absent from *Paranisops* species (Figs 58–60). The seventh abdominal tergite of *Walambianisops* is asymmetrical, that of *Paranisops* symmetrical with a prominent sclerotised projection extending caudad dorsally (Figs 58–61). The eighth abdominal segment is much the same in both genera. The male genitalia of *Paranisops* (Fig. 62) are robust, well-sclerotised structures, cleft posteriorly. The parameres of *P. endymion* are symmetrical, of *P. inconstans* Hale, asymmetrical; those of *Walambianisops* are much like the generalised type found in *Anisops* and *Buenoa*. The first gonapophysis of *Anisops*, *Buenoa* and *Walambianisops* are all heavily sclerotised and spinose, whereas *Paranisops* has a feebly sclerotised first gonapophysis which are plate-like with a few spines distally.

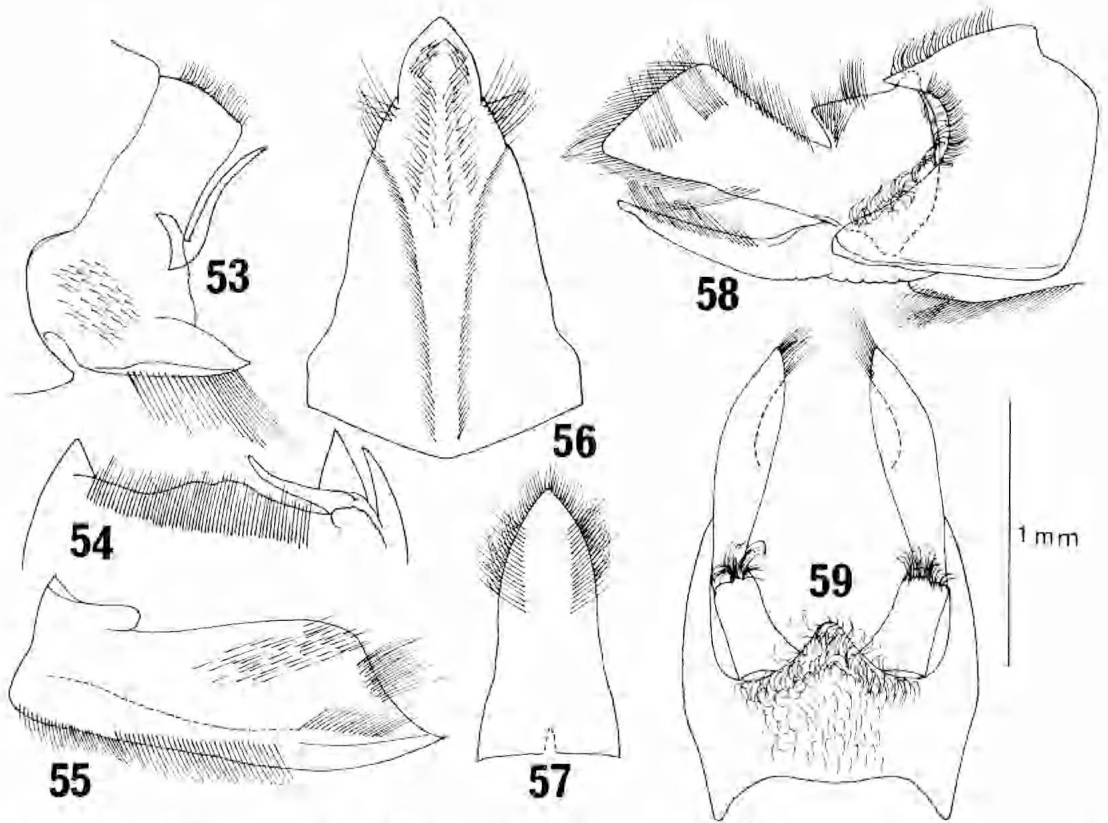


Figs 50–52: *Walambianisops wandjina* gen. and sp. nov. (50) male aedeagus; (51) coxal plates and connexivum of male; (52) female genitalia; terminology 8–9 paratergites 8 & 9, 1 & 2 gpo 1st and 2nd gonapophysis, 1 & 2 gx 1st and 2nd gonocoxa, ga gonangulum, gpl gonoplac.

meres (claspers) large and asymmetrical (Figs 48, 49), aedeagus membranous (Fig. 52).

Female genitalia (Fig. 52): first gonocoxa elongate, anterior margin infolded forming a partial ramus. First gonapophysis large, sclerotised with stout spines distally, ventrally fringed with short hairs. Gonangulum elongate, almost reniform, fused to paratergite nine. Second gonocoxa membranous and acutely triangular. Second gonapophysis membranous, distally lightly sclerotised. Gonoplac stylus-like with scattered hairs.

Features unique to *Walambianisops* males include the four groups of setae on the front femur and the row of pegs across the front tibia. (The latter are homologous with the more complex stridulatory peg row of *Anisops* and *Buenoa*. The row of serrations along the third rostral segment of *Walambianisops* can be equated with the rostral prong of related genera.) Finally, there is a series of half-moon shaped projections on the outer lateral margins of the connexivum. Female *Walambianisops* can be distinguished from *Paranisops* by the smooth coxal plates; in *Paranisops* these plates are covered in black hairs. Females of *Walambianisops* may be distinguished from *Anisops* by their two-segmented antennae (those of *Anisops* are always three-segmented). Although the antennae of *Walambianisops* are two-segmented, the general chaetotaxy closely resembles that of *Anisops* (Lundblad 1933).



Figs 53-59: *Walambianisops waulfina* gen. and sp. nov. Figs 53-57: (53) male 7th tergite side view; (54) *ibid.*, dorsum; (55) side view of female operculum; (56) *ibid.*, ventrally; (57) male operculum ventrally; *Paranisops inconstans* Hale male. Figs 58-59: side and dorsal aspects of 7th and 8th tergites.

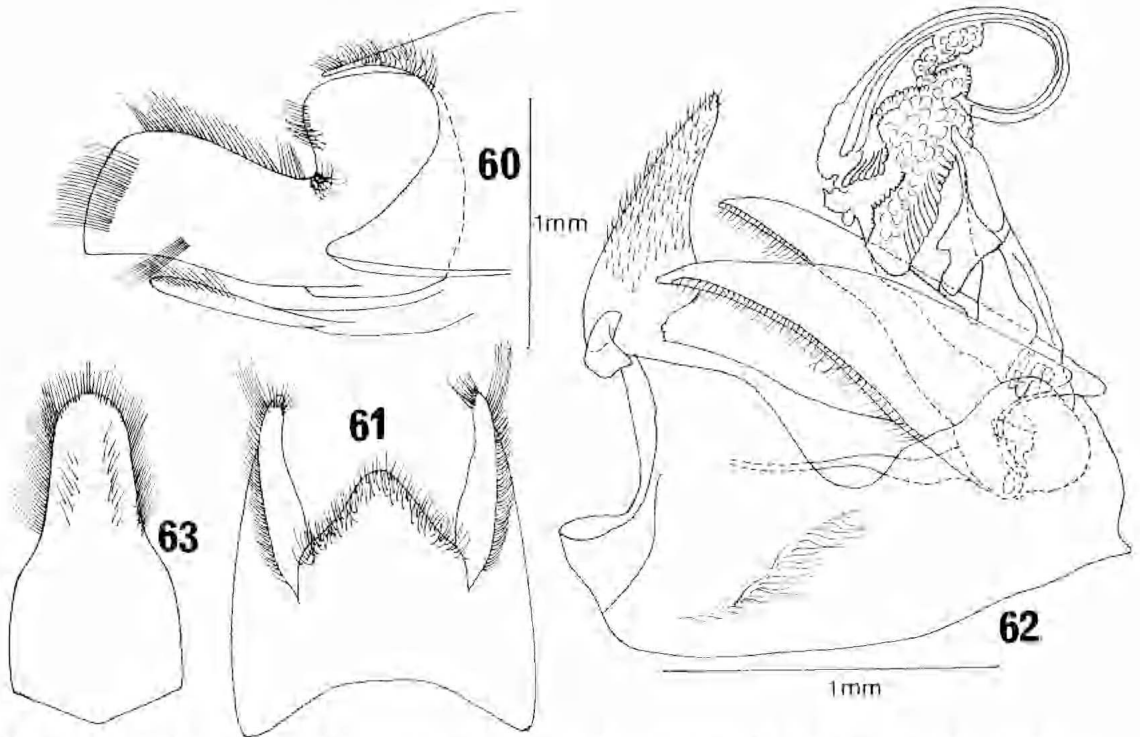
Walambianisops shares a number of features with *Anisops* and *Paranisops*. However, the combination of characters found in *Walambianisops* supports the hypothesis that *Anisops*, *Buenoa* and *Walambianisops* are more closely related to each other than they are to *Paranisops*. The key to the Australian genera of Notonectidae reflects the close relationship of *Walambianisops* and *Anisops*. However, if secondary sexual characters are used, as in the alternative key to the Anisopinae, *Walambianisops* is shown to be quite distinct from other genera of the subfamily.

Anisops, itself is a large genus with ca. 30 species known from Australia (well over 100 in the Old World). One species, *A. agalia* Hutchinson from South Africa, was placed in a separate subgenus *Anisopoides* as the males lack a rostral prong, the stridulatory pegs are arranged in the same way as in *Walambianisops*, the front tibia is enlarged apically (those of *Walambianisops* are not).

Anisops agalia males, like all other species in the genus, have one-segmented front tarsi. No information is available on the presence of discrete auditory specialisations on the rostrum.

Buenoa males have two-segmented front tarsi, a rostral prong, and most, in addition to the stridulatory comb on the front tibia, have a stridulatory area on the front femur. The secondary stridulatory zone is absent from all Old World Anisopinae. Possible secondary stridulatory features have been described on *Anisops milloti* Poisson from Madagascar (Lansbury, 1966).

Unusual if not unique in the Anisopinae, the female of *Paranisops endymion* bears several secondary sexual characters (extensions to hind margins of eyes, and projections on the lateral margins of the pronotum). They are more fully described in Lansbury (1964). Females of the related species *P. inconstans* do not exhibit this reversal of secondary



Figs 60-63: *Paranisops endymion* (Kirkaldy) male. (60) side view of 7th tergite, (61) *ibid.*, dorsum of 7th tergite; (62) genital capsule, after Lansbury, 1964; (63) operculum.

sexual characters. The data available for *Paranisops* show that *P. endymion* is restricted to south-west Australia, and the distributional gap between *P. endymion* and *Walambianisops* is extremely wide. Lansbury (1964) observations on *P. endymion* were based on limited numbers of specimens from various localities. There was no data on the relative abundance of the "macropterous" or dark form *P. inconstans inconstans* compared with the leucochroic form *P. inconstans* var *lutea* Hale in a population. During 1979 at Cedar Falls near Brisbane *P. inconstans* was found in relatively large numbers in deep, shaded water under a bridge. The "macropterous" form *P. inconstans inconstans* uncommon; one male and two females in a sample of 34 males and 56 females, remainder being *P. inconstans* var *lutea*. *P. inconstans* is an eastern coastal species recorded from N.S.W. and Queensland.

The two species of *Paranisops* are characterised by the flat operculum (Figs 60, 63), the posteriorly cleft genital capsule, the hairy coxal plates, the carinate frons and the thin plate-like first gonapophysis. *P. endymion* males have symmetrical parameres, females

have secondary sexual characters. The chaetotaxy of the male and female front legs is similar except in the claws which are dimorphic. *P. inconstans* males have asymmetrical parameres, the chaetotaxy of the male front leg differs markedly from that of the female, the claws are not sexually dimorphic, and the female does not have any obvious secondary sexual characters (as exhibited by *P. endymion*). The similarities and quite striking differences between these two species suggests that generic concepts within the Anisopinae are fairly flexible.

Key to Australian genera of Notonectidae

1. Hemelytral commissure continuous, without a hair-lined pit close to the apex of the scutellum (Notonectinae) 2
- Hemelytral commissure with a prominent hair-lined pit close to the apex of the scutellum (Anisopinae) 4
2. Mid-femur with a large spine ante-apically (Fig. 33). Eyes dorsally widely separated (Fig. 26) 3
- Mid-femur with a small spine ante-apically. Eyes dorsally contiguous forming an ocular commissure, i.e. appearing to be

joined or overlapping, no synthipsis

Nychia

3. Antero-lateral margins of the pronotum not foveate *Notonecta*

— Antero-lateral margins of the pronotum foveate (Figs 26, 32) *Enithares*

4. Coxal plates shining, sometimes coarsely striate, distally occasionally fringed with black hairs 5

— Coxal plates covered with black hairs *Paramisops*

5. Antennae two-segmented (Fig. 43) *Walambianisops* gen. nov.

— Antennae three-segmented *Anisops*

Alternative key to Australian genera of Anisopinae

1. Prominent rostral prong. Front tibia enlarged apically with a row of stridulatory pegs. Front tarsus one-segmented in male, two-segmented in female. Operculum carinate *Anisops*

Rostral prong absent. Front tibia not enlarged apically to accommodate stridulatory pegs (if present). Front tarsi two-segmented in both sexes. Operculum either flat or convex 2

2. Coxal plates bare. Front femur with four groups of setae. Pegs of stridulatory row all clearly separate. Antennae two-segmented. Frons and vertex bulbous

Walambianisops

— Coxal plates covered in black hairs. Front femora without groups of setae. Stridulatory pegs absent. Antennae three-segmented. Frons and vertex carinate

Paramisops

Family: NEPIDAE

Austronepea angusta (Hale)

Curiea angusta Hale, 1924, pp. 508–509

Austronepea angusta: Menke & Stange, 1964, pp. 67–72 (new genus for *angusta*).

Austronepea angusta: Lansbury, 1967, pp. 641–644.

Austronepea is widely distributed through the tropical fringe of the Northern Territory and in Queensland down to Stradbroke Island. Breeding sites vary. They include road-side pools and ditches with or without dense growths of macrophytes (as in Queensland near Mareeba), small shallow grassy pools (e.g. by the Mary River along the Arnhem Highway, N.T.), and large billabong (e.g. near Nourlangee Rock, Northern Territory, where *Austronepea* was found in deep water amongst *Pandanus* roots). It is fairly common at Fogg Dam near Darwin which has clear water, and abundant at McMinns Lagoon also near Darwin, where the water is extremely turbid. Although found in a wide variety of habitats, all are lentic or slow lotic. Little

variation is apparent in size and external morphology of the species, and the male genitalia are uniform throughout the range.

Material examined: W.A.: WAM 79-149–55, Kalumburu Mission, Kimberley, 1.1960. A. M. Douglas & G. Mees, two males, two females and three immatures (4th–5th instar), in the Western Australian Museum, Perth.

Ranatra diminuta Montandon

Ranatra longipes var. *diminuta* Montandon, 1907, p. 57.

Ranatra diminuta Montandon: Lansbury, 1972, pp. 323–326 (var. *diminuta* elevated to species).

In Lansbury (1972), specimens from north-west Australia of *R. diminuta* key out as *R. longipes* Stål, because the eyes are clearly wider than the interocular space. However, the male genitalia of the two species are distinctive; the parameres of *R. diminuta* have a prominent tooth distally, this projection is missing in *R. longipes*. The status of several species of *Ranatra* from the Australasian region is open to question. A possible synonym of *R. diminuta* is *R. biroi* Lundblad (1933) described from New Guinea (Astrolabe Bay). Comparison of the types of *R. biroi* with those of *R. diminuta* seemed to indicate that the status of both species was valid (Lansbury, 1972). However, more recent studies of additional material from Australia, New Guinea and the Philippines has shown that characters previously used, such as eye width-interocular space, distance between middle coxae compared with hind coxae, and elevation of vertex above eyes—are all taxonomically unreliable. Another species described from Millstream, Western Australia (*R. occidentalis* Lansbury) is also part of the *R. diminuta* complex. As *R. occidentalis* appears to be geographically isolated from mainland Australia *R. diminuta*, it is still tentatively regarded as a distinct species. Typical *R. diminuta* is fairly common in the Philippines, but there is a high level of trivial variation in the shape of the parameres (see Lansbury, 1972). A large series of *R. diminuta* from Queensland has: 49% have the eye width equalling interocular space, 37% have the eye width less than interocular space, 14% have the eye width greater than interocular space. The simplistic shape and lack of "ornamentation" throughout most of the small oriental *Ranatra* renders the species limits obscure.

Material examined: W.A.: WAM 79–126, Wotjulum Mission via Derby, Kimberley.

xij.1955, A. M. Douglas, two males and two females in the Western Australian Museum, Perth.

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